



1 Mbit/s High Speed Transistor Coupler

Features

- High speed 1Mbit/s
- High isolation voltage between input and output (Viso=3750 Vrms)
- Guaranteed CTR performance from 0°C to 70°C
- Wide operating temperature range of -55°C to 100°C
- Green Package
- Regulatory Approvals
 - UL - UL1577 (E364000)
 - VDE - EN60747-5-5(VDE0884-5)
 - CQC – GB4943.1, GB8898
 - IEC60065, IEC60950

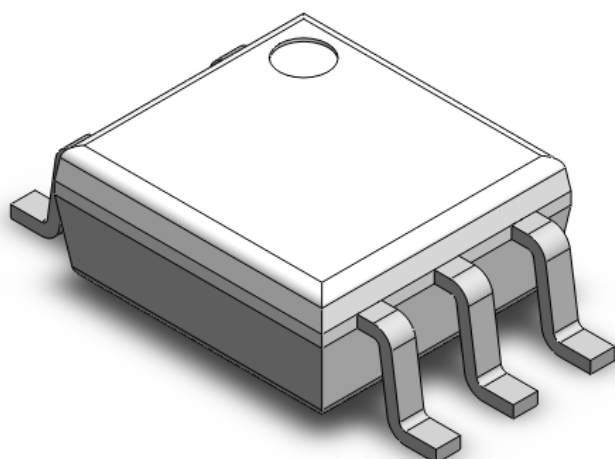
Description

The CTM452 and CTM453 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in a Mini-Flat package .

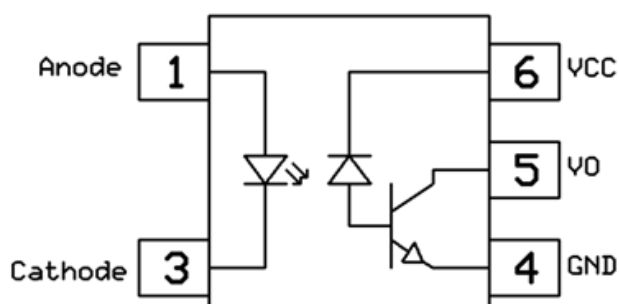
Applications

- Line receivers
- Telecommunication equipment
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

Package Outline



Schematic





CTM452, CTM453

5 Pin Mini-Flat

1 Mbit/s High Speed Transistor Coupler

Absolute Maximum Rating at 25°C

| Symbol | Parameters | Ratings | Units | Notes |
|-----------------------|--|----------------|------------------|--------------|
| V _{ISO} | Isolation voltage *1 | 3750 | V _{RMS} | |
| T _{OPR} | Operating temperature | -55 ~ +100 | °C | |
| T _{STG} | Storage temperature | -55 ~ +125 | °C | |
| T _{SOL} | Soldering temperature *2 | 260 | °C | |
| Emitter | | | | |
| I _F | Forward current | 25 | mA | |
| I _{FP} | Peak forward current (50% duty, 1ms P.W) | 50 | mA | |
| I _{F(TRANS)} | Peak transient current (≤1μs P.W,300pps) | 1 | A | |
| V _R | Reverse voltage | 5 | V | |
| P _D | Power dissipation | 45 | mW | |
| Detector | | | | |
| P _D | Power dissipation | 100 | mW | |
| I _{O(AVG)} | Average Output current | 8 | mA | |
| I _{O(Peak)} | Peak Output current | 16 | mA | |
| V _O | Output voltage | -0.5 to 20 | V | |
| V _{CC} | Supply voltage | -0.5 to 30 | V | |



Electrical Characteristics

$T_A = 0 - 70^\circ\text{C}$ (unless otherwise specified). Typical values are measured at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5\text{V}$

Emitter Characteristics

| Symbol | Parameters | Test Conditions | Min | Typ | Max | Units | Notes |
|---------------------------|--|-----------------------|-----|------|-----|----------------------|-------|
| V_F | Forward voltage | $I_F = 16\text{mA}$ | - | 1.45 | 1.6 | V | |
| V_R | Reverse Voltage | $I_R = 10\mu\text{A}$ | 5.0 | - | - | V | |
| $\Delta V_F / \Delta T_A$ | Temperature coefficient of forward voltage | $I_F = 16\text{mA}$ | - | -1.6 | - | mV/ $^\circ\text{C}$ | |

Detector Characteristics

| Symbol | Parameters | Test Conditions | Min | Typ | Max | Units | Notes |
|-----------|---------------------------|--|-----|-------|-----|---------------|-------|
| I_{OH} | Logic High Output Current | $I_F = 0\text{mA}$, $V_O = V_{CC} = 5.5\text{V}$, $T_A = 25^\circ\text{C}$ | - | 0.001 | 0.5 | μA | |
| | | $I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$, $T_A = 25^\circ\text{C}$ | - | 0.01 | 1 | | |
| | | $I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$ | - | - | 50 | | |
| I_{CCL} | Logic Low Supply Current | $I_F = 16\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{V}$ | - | 120 | 200 | μA | |
| I_{CCH} | Logic High Supply Current | $I_F = 0\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{V}$, $T_A = 25^\circ\text{C}$ | - | 0.01 | 1 | μA | |
| | | $I_F = 0\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{V}$ | - | - | 2 | | |



Electrical Characteristics

$T_A = 0 - 70^\circ\text{C}$ (unless otherwise specified). Typical values are measured at $T_A = 25^\circ\text{C}$ and $V_{CC}=5\text{V}$

Transfer Characteristics

| Symbol | Parameters | Test Conditions | Min | Typ | Max | Units | Notes |
|----------|--------------------------|--|-----|-----|-----|-------|-------|
| CTR | Current Transfer Ratio | $I_F=16\text{mA}, V_O=0.4\text{V}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$ | 20 | - | 50 | % | |
| | | $I_F=16\text{mA}, V_O=0.5\text{V}, V_{CC}=4.5\text{V}$ | 15 | - | - | | |
| V_{OL} | Logic Low Output Voltage | $I_F=16\text{mA}, I_O=3\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$ | - | - | 0.4 | V | |
| | | $I_F=16\text{mA}, I_O=2.4\text{mA}, V_{CC}=4.5\text{V}$ | - | - | 0.5 | | |

Electrical Characteristics

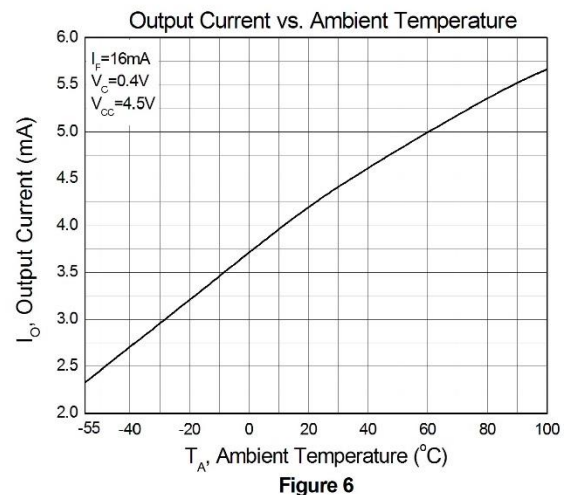
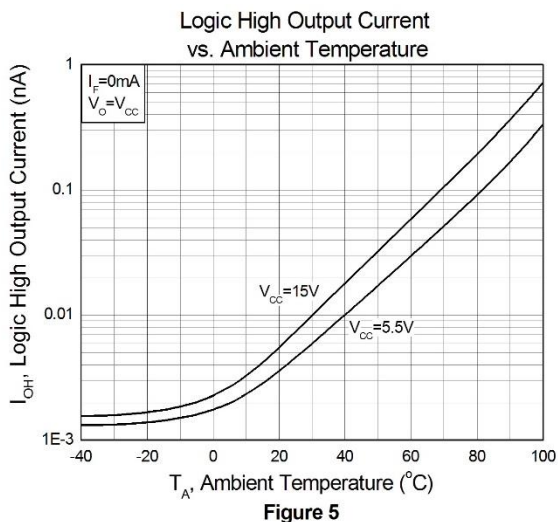
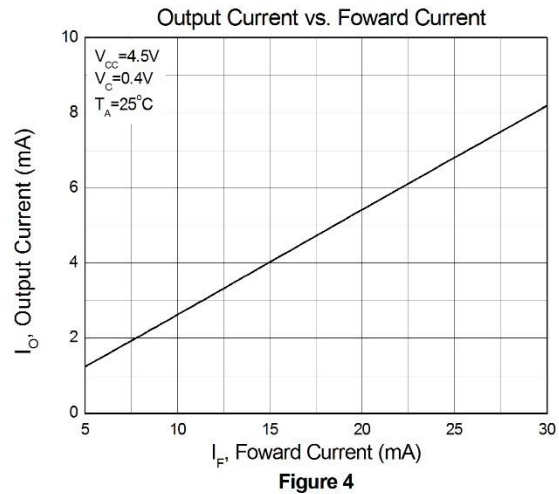
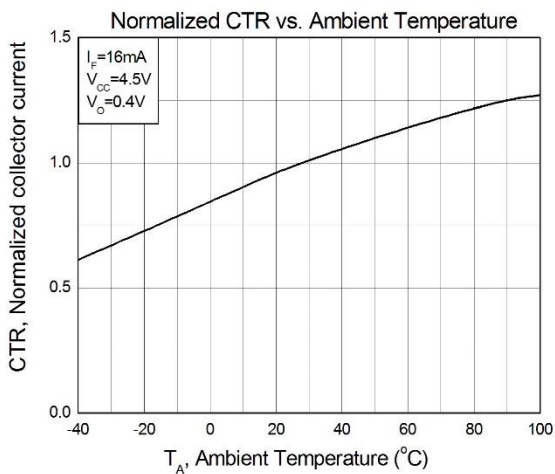
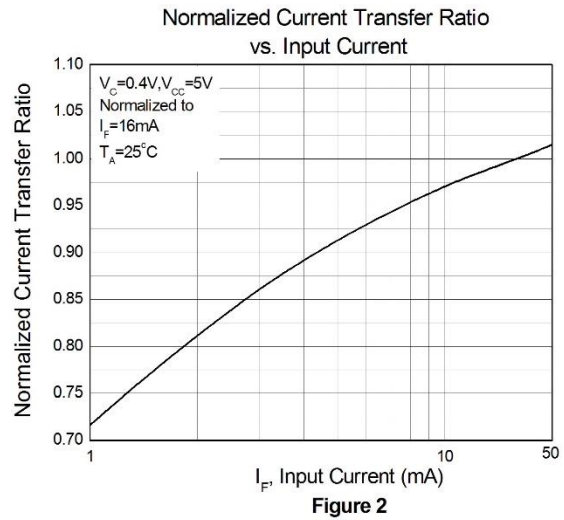
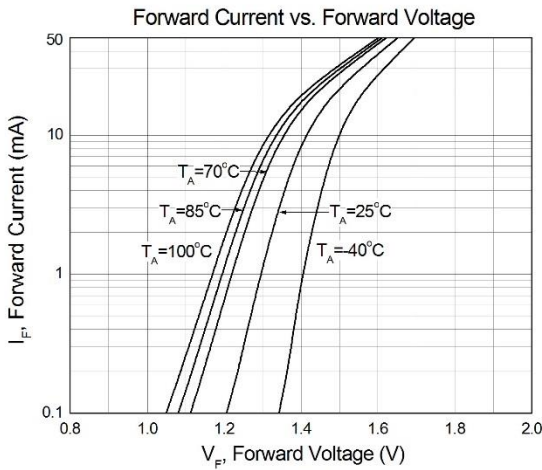
$T_A = 0 - 70^\circ\text{C}$ (unless otherwise specified). Typical values are measured at $T_A = 25^\circ\text{C}$ and $V_{CC}=5\text{V}$

Switching Characteristics

| Symbol | Parameters | Test Conditions | Min | Typ | Max | Units | Notes |
|-----------|--|--|--------|------|-----|------------------------|-------|
| T_{PHL} | Propagation Delay Time Logic High to Logic Low | $I_F=16\text{mA}, R_L=1.9\text{K}\Omega, T_A=25^\circ\text{C}$ | - | 0.35 | 0.8 | μs | |
| | | $I_F=16\text{mA}, R_L=1.9\text{K}\Omega$ | - | - | 1.0 | | |
| T_{PLH} | Propagation Delay Time Logic Low to Logic High | $I_F=16\text{mA}, R_L=1.9\text{K}\Omega, T_A=25^\circ\text{C}$ | - | 0.3 | 0.8 | μs | |
| | | $I_F=16\text{mA}, R_L=1.9\text{K}\Omega$ | - | - | 1.0 | | |
| CM_H | Common Mode Transient Immunity at Logic High | CTM452 $I_F = 0\text{mA}, V_{CM}=10\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A=25^\circ\text{C}$ | 5,000 | - | - | $\text{V}/\mu\text{s}$ | |
| | | CTM453 $I_F = 0\text{mA}, V_{CM}=1500\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A=25^\circ\text{C}$ | 15,000 | - | - | | |
| CM_L | Common Mode Transient Immunity at Logic Low | CTM452 $I_F = 16\text{mA}, V_{CM}=10\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A=25^\circ\text{C}$ | 5,000 | - | - | $\text{V}/\mu\text{s}$ | |
| | | CTM453 $I_F = 16\text{mA}, V_{CM}=1500\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A=25^\circ\text{C}$ | 15,000 | - | - | | |



Typical Characteristic Curves





Typical Characteristic Curves

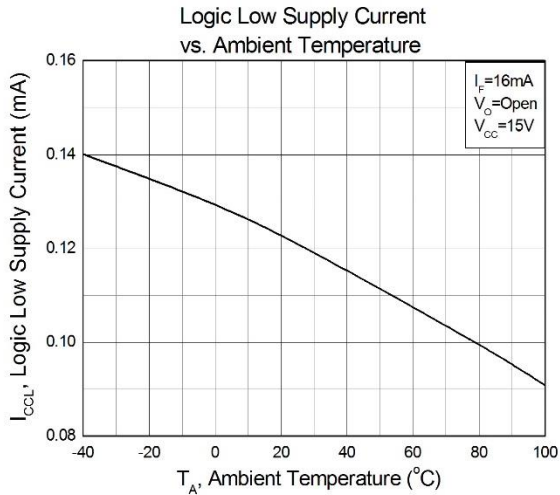


Figure 7

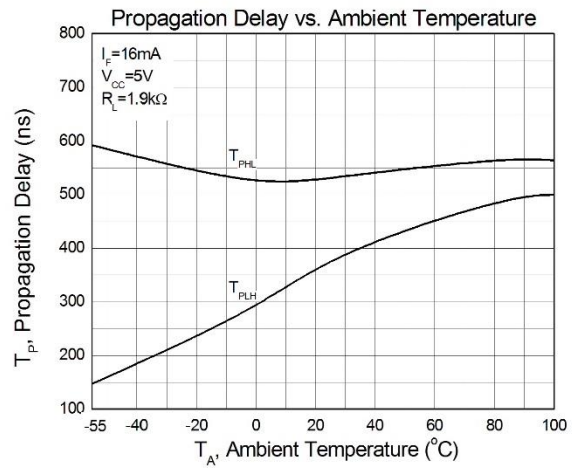


Figure 8

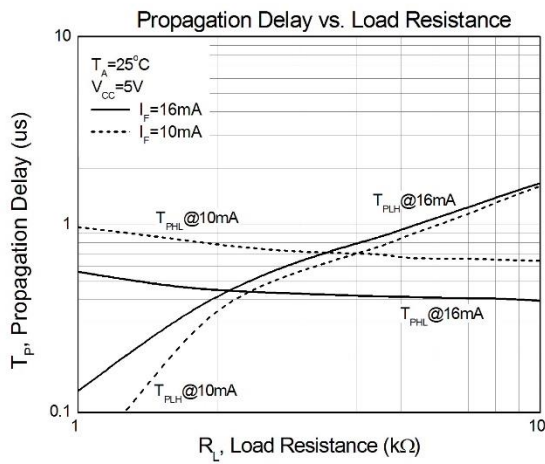


Figure 9

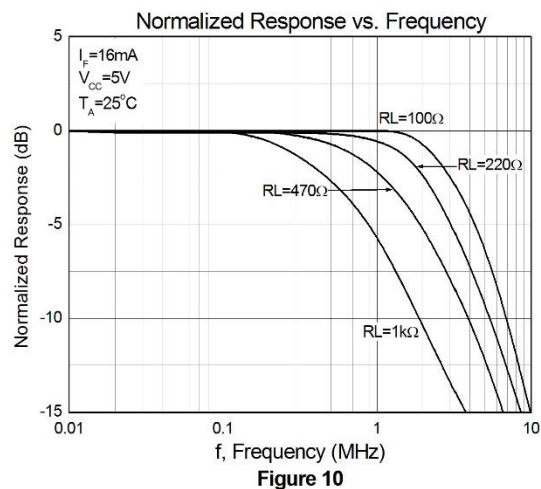
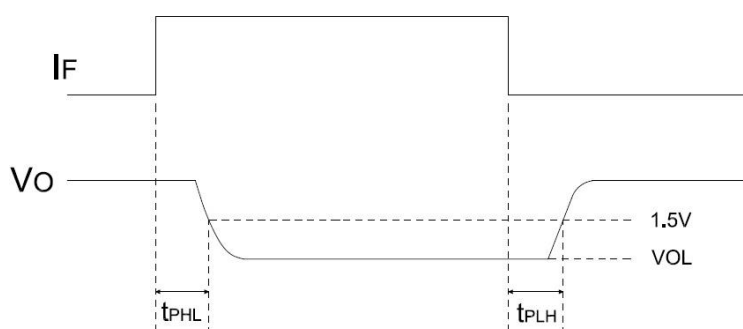
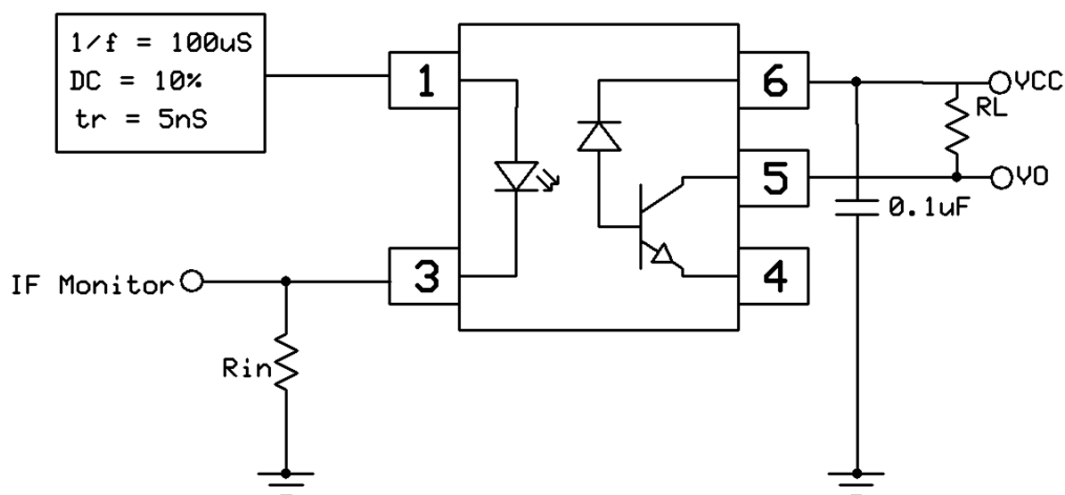


Figure 10



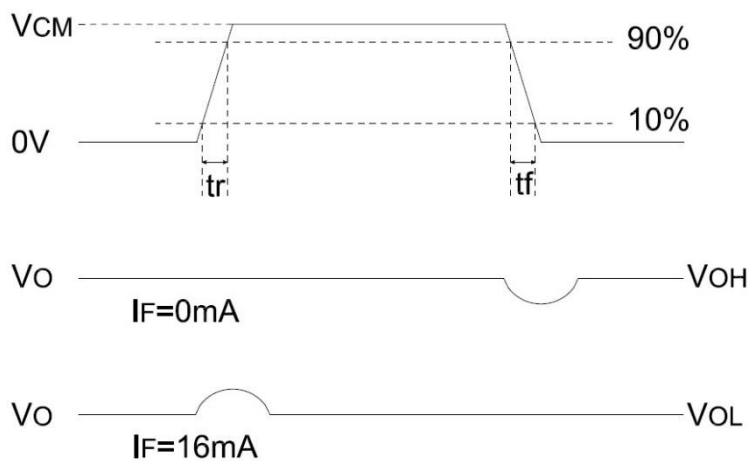
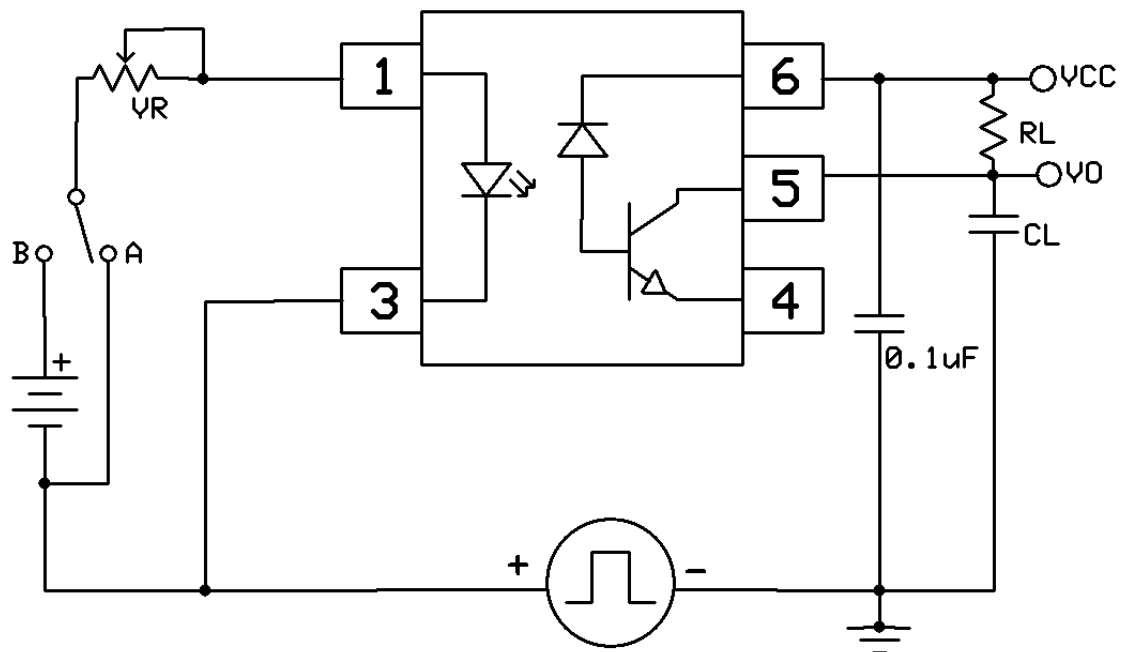
Test Circuits



Switching Time Test Circuit



Test Circuits



CMR Test Circuit

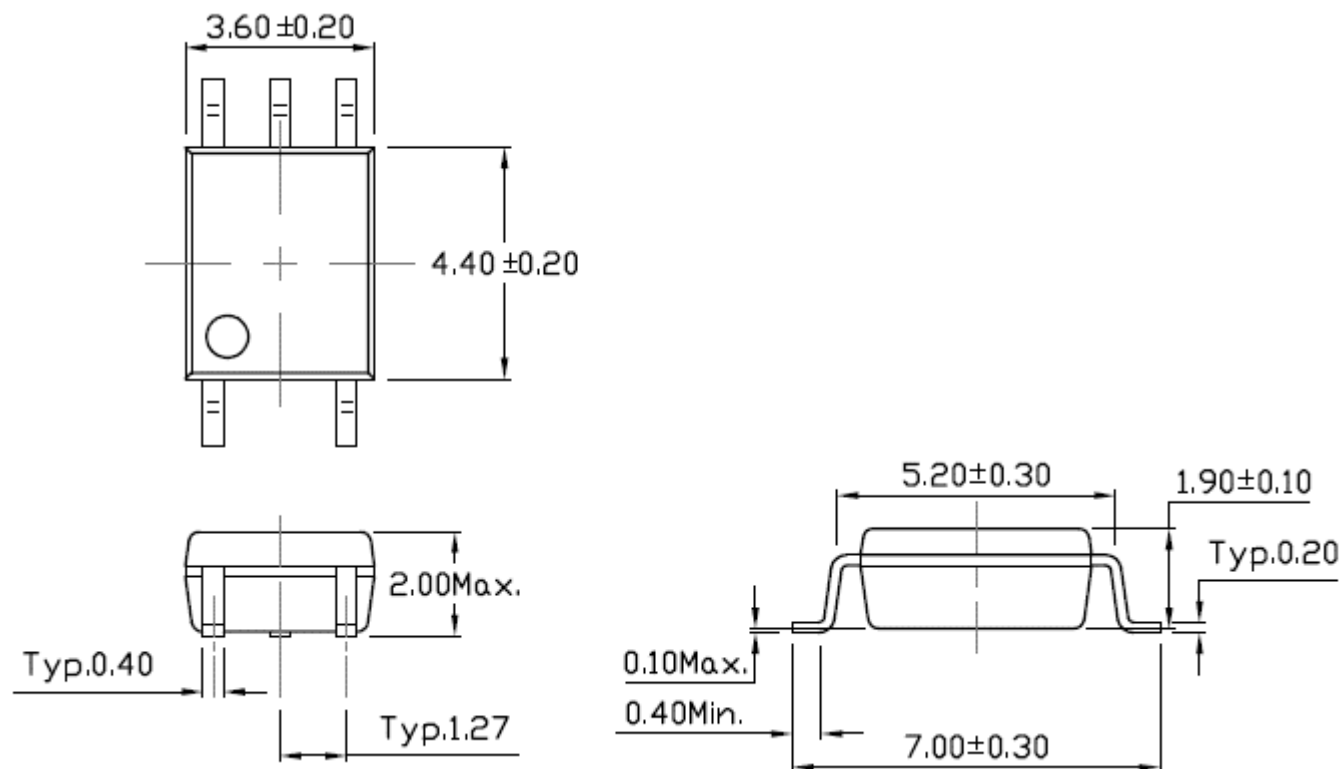


CTM452, CTM453

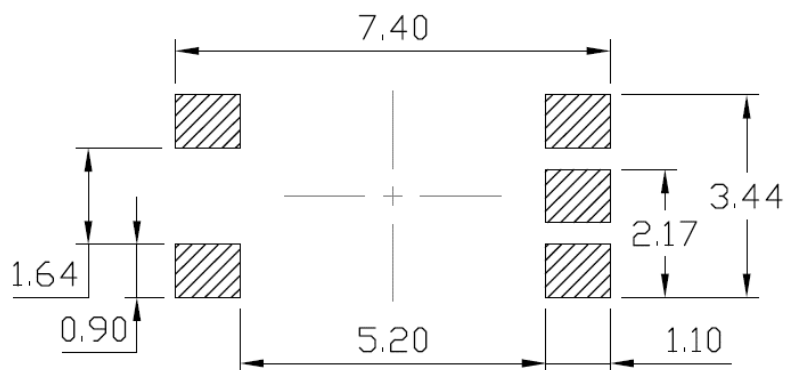
5 Pin Mini-Flat

1 Mbit/s High Speed Transistor Coupler

Package Dimension *Dimensions in mm unless otherwise stated*



Recommended Solder Mask *Dimensions in mm unless otherwise stated*





Marking Information



Note:

- CT : Denotes “CT Micro”
- M453 : Product Number
- V : VDE Option
- Y : Fiscal Year
- WW : Work Week
- K : Production Code

Ordering Information

CTM45X(V)(Z)

X = Part No. (X=2 or 3)

V = VDE Option (V or none)

Z = Tape and reel option (T1, T2, T3 or T4)

| Option | Description | Quantity |
|---------------|--|-----------------|
| T1 | Surface Mount Lead Forming – With Option 1 Tapping | 3000 Units/Reel |
| T2 | Surface Mount Lead Forming – With Option 2 Tapping | 3000 Units/Reel |
| T3 | Surface Mount Lead Forming – With Option 3 Tapping | 3000 Units/Reel |
| T4 | Surface Mount Lead Forming – With Option 4 Tapping | 3000 Units/Reel |



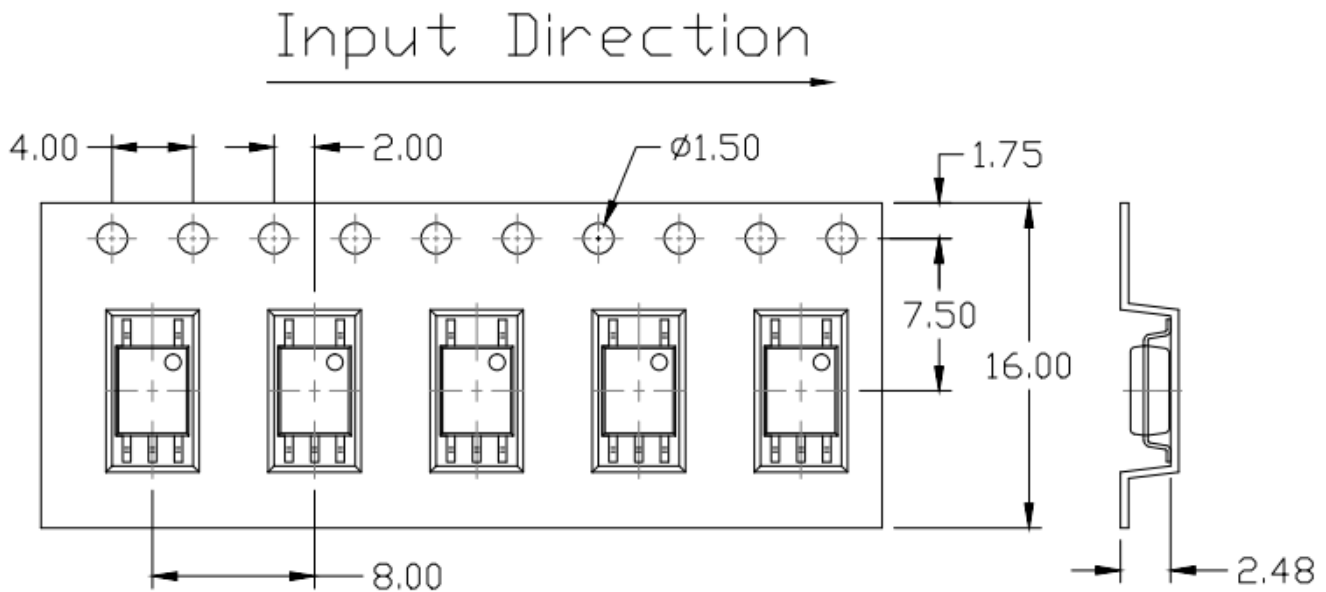
CTM452, CTM453

5 Pin Mini-Flat

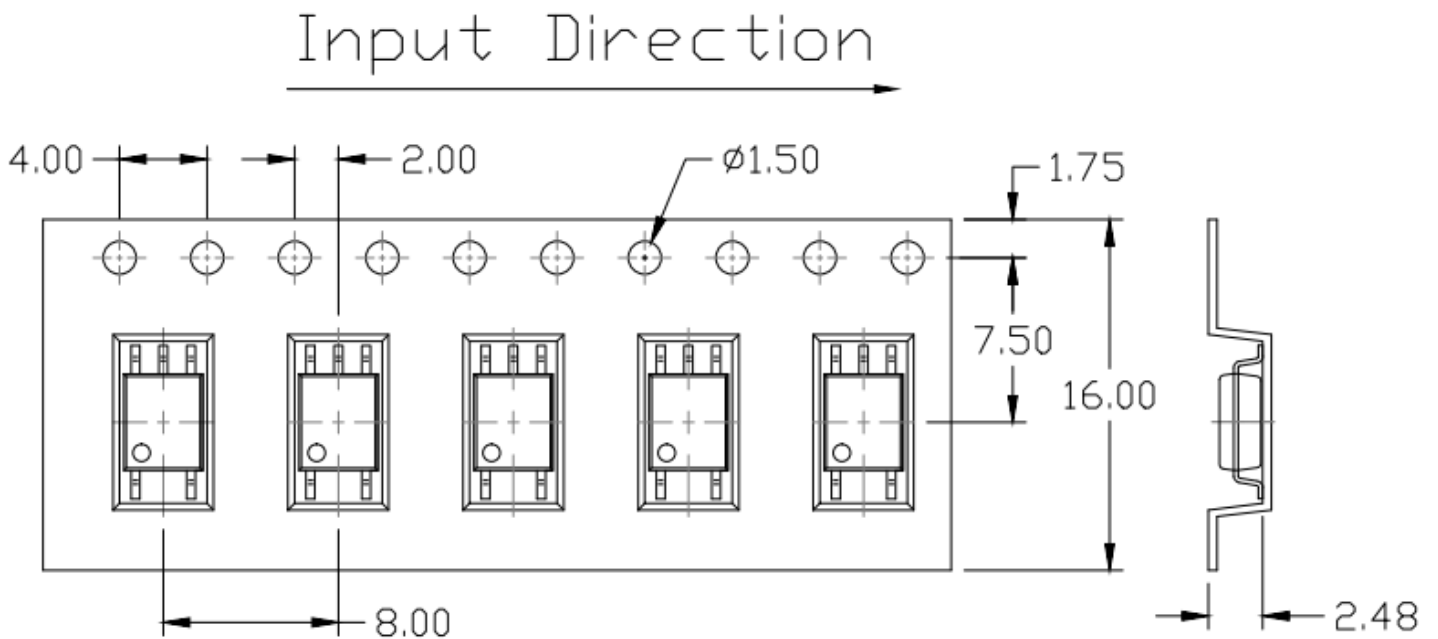
1 Mbit/s High Speed Transistor Coupler

Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

Option T1



Option T2



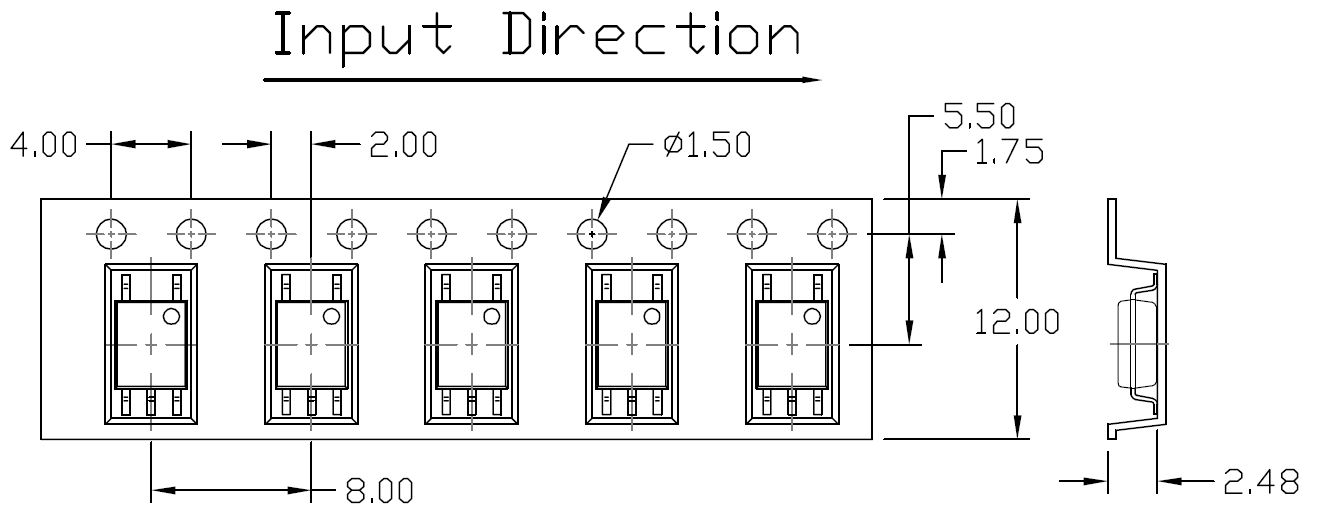


CTM452, CTM453

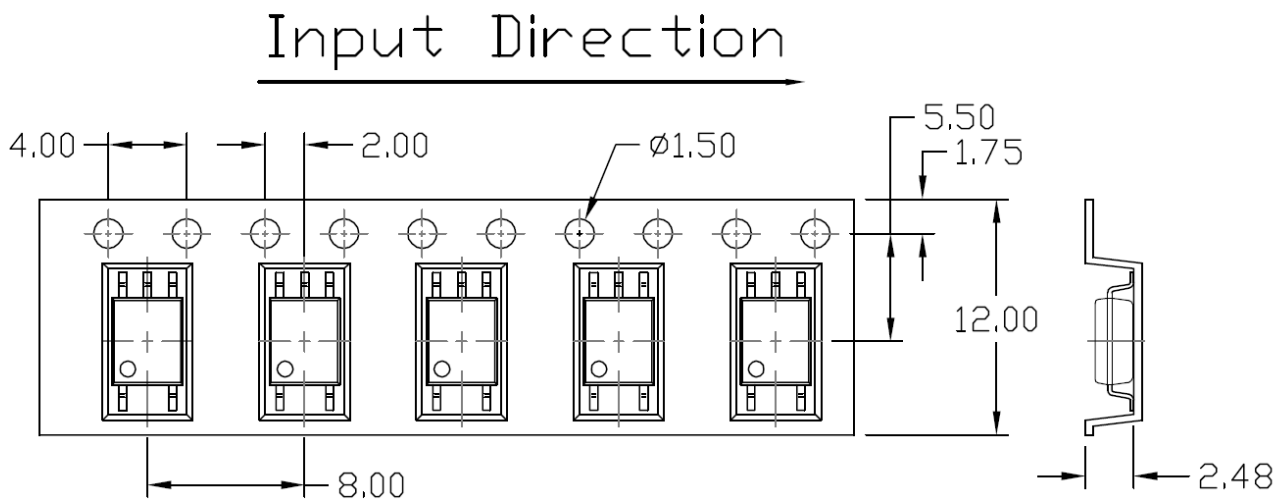
5 Pin Mini-Flat

1 Mbit/s High Speed Transistor Coupler

Option T3

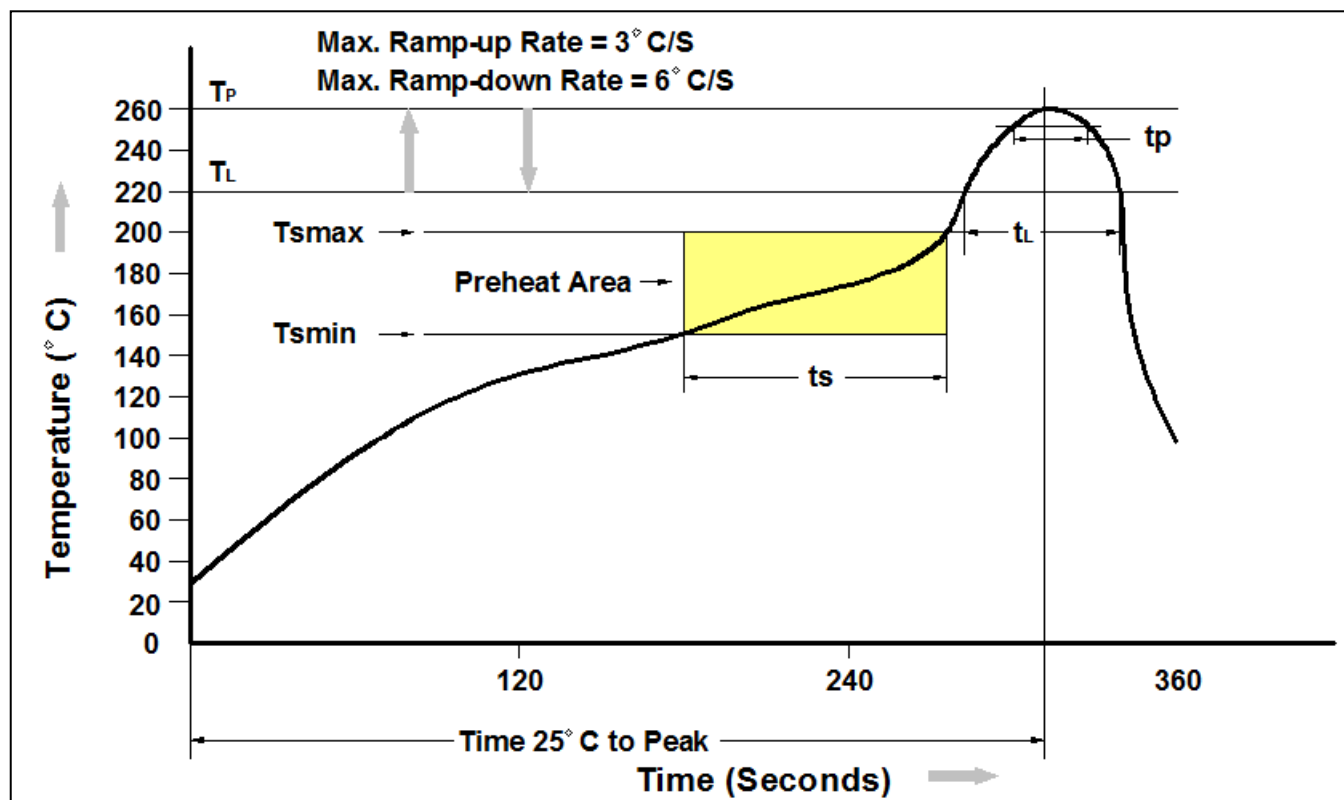


Option T4





Reflow Profile



| Profile Feature | Pb-Free Assembly Profile |
|--|--------------------------|
| Temperature Min. (T_{smin}) | 150°C |
| Temperature Max. (T_{smax}) | 200°C |
| Time (t_s) from (T_{smin} to T_{smax}) | 60-120 seconds |
| Ramp-up Rate (t_L to t_P) | 3°C/second max. |
| Liquidous Temperature (T_L) | 217°C |
| Time (t_L) Maintained Above (T_L) | 60 – 150 seconds |
| Peak Body Package Temperature | 260°C +0°C / -5°C |
| Time (t_P) within 5°C of 260°C | 30 seconds |
| Ramp-down Rate (T_P to T_L) | 6°C/second max |
| Time 25°C to Peak Temperature | 8 minutes max. |



CTM452, CTM453

5 Pin Mini-Flat

1 Mbit/s High Speed Transistor Coupler

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